UNITED STATES GOVERNMENT

memorandum

DATE: July 24, 2000

REPLY TO
ATTN OF: Wireless Telecommunications Bureau Policy Division

SUBJECT: Summary of FCC E911 Phase II Reconsideration Proceeding Multi-Party Meeting June 29, 2000

TO: Magalie Roman Salas, Secretary, FCC

The Wireless Telecommunications Bureau Policy Division hereby submits an *ex parte* summary of the FCC E911 Phase II Reconsideration Proceeding Multi-Party Meeting, held June 29, 2000, in CC Docket 94-102, as well as the list of questions that was distributed to meeting participants prior to this meeting.

Summary of FCC E911 Phase II Reconsideration Proceeding Multi-Party Meeting
June 29, 2000

Tom Sugrue, Chief, Wireless Telecommunications Bureau, advised attendees that FCC staff had requested this meeting with parties in order to discuss differing views as to what needs to be done to facilitate wireless carriers' implementation of E911 automatic location identification (ALI) technologies that comply with the FCC's accuracy and reliability requirements. The FCC's goal is to have accurate, reliable, and ubiquitous E911 service, but the question today is how to get there.

FCC staff proceeded to pose the following questions to parties in attendance.

1. What ALI solutions are available, or likely to be available, network-based, handset-based, or hybrid, within the next few years, i.e., by 2005, for the various wireless interfaces?

Verizon Wireless

Verizon Wireless (now comprising the former AirTouch, Bell Atlantic Mobile, GTE Wireless, and PrimeCo) indicated that it has been concentrating primarily on testing network-based solutions for the CDMA air-interface, and to a lesser degree, for AMPs. Verizon stated that it had tested with True Position and U.S. Wireless, but has done little independent verification of test results reported by location technology vendors. Verizon has primarily been testing in suburban areas. It has planned an urban and limited suburban network-based test in Manhattan that should conclude before the end of September, but has not tested in extremely rural areas. Verizon indicated that it has not pursued testing of handset-based or hybrid technologies.

Sprint PCS

Sprint PCS indicated that it has been exploring network-based solutions for CDMA since the first quarter of 1997, working with Radix, the only developer that was developing a network-based solution. In Spring 2000, Sprint completed a lab test with Radix, which showed that the technology works well in ideal situations (suburban), but does not work in certain other situations. Sprint has not done real world testing of this technology. Sprint stated that it does not consider this network solution a good fit and that it would be challenged to deploy the technology in its system. One of the difficulties would be lack of physical room in Sprint base stations, because base stations have been shrinking. Sprint has tested Lucent's server-assisted GPS solution in Tampa but no data is available yet. Sprint has done some limited testing with Lucent's hybrid forward link triangulation (FLT) technology, which has shown some good and bad results. The technology shows some promise and may improve with alternative engineering, but currently does not meet the accuracy and reliability requirements.

VoiceStream Wireless

VoiceStream Wireless indicated that it has performed some time-of-arrival (TOA) trials for GSM at several sites. Although it shows some promise for meeting the mandate VoiceStream is no longer pursuing that solution, because there is currently no TOA equipment available from major vendors for GSM. VoiceStream expressed concern about the location technologies causing a reduction in spectrum efficiency for GSM networks. Also, Voice Stream stated that it does not appear that GPS handsets for GSM will be available in time. Enhanced Observed Time Difference (E-OTD) appears to be the best solution, and it may be deployable by the deadline. VoiceStream is currently participating in a trial with BellSouth and other GSM operators and vendors, and results will be forthcoming. VoiceStream has not considered a GPS solution.

Ericsson

Ericsson indicated that with respect to GSM systems, it is currently commercially supplying cell ID and timing advance location technology in Europe (500-meter accuracy or less), and has investigated TOA, server-assisted GPS, and E-OTD. Ericsson is pursuing an enhancement to the cell ID and timing advance technology that moves closer to the required accuracy and reliability, but this technology currently does not meet the requirements. Ericsson stated that it has also been looking into E-OTD. Ericsson believes E-OTD will probably be available around the deadlines set forth, but contends that this technology will not meet the handset accuracy and reliability mandates (50 meters 67% of the time/150 meters 95% of the time for handset-based systems). Ericsson has performed server-assisted GPS lab trials for GSM and some limited field use. The results so far have been good, but there is little enthusiasm from carriers due to added complexities.

With regard to TDMA, use of cell ID and timing advance raises bandwidth issues and yielded poorer results than use of such technology with GSM. Ericsson's tests of E-OTD with TDMA systems yielded results that did not meet the accuracy requirements. Ericsson stated that E-OTD would also require TDMA network hardware and software additions that can not be accomplished within the required time frame. Ericsson indicated that using E-OTD with TDMA systems is more difficult, and achieves lower accuracy levels, than use of E-OTD with GSM, because of differences in bandwidth and processing times between the air interfaces. Ericsson expressed the opinion that use of E-OTD with TDMA will be better than Phase I, but will not meet Phase II requirements.

Ericsson stated that, for TDMA and GSM, server-assisted GPS accuracy meets the requirements but delivering handsets on schedule would be highly problematic. Also, Ericsson is not pursuing an in-house network solution, and instead is assisting third parties with the development of these solutions for CDMA and TDMA interfaces. Ericsson is concerned, however, about having to vouch for the efficacy and reliability of any network solution. Ericsson is using Qualcomm GPS chipsets for CDMA and has not done any work on a hybrid solution for CDMA. The accuracy of the cell ID and timing advance solution, when used with TDMA, is 200-500 meters, depending on the environment, and

will not get much better. Of the various air interfaces, Ericsson believes that, in the long run, GSM will have the most options among location technologies.

Qualcomm

Qualcomm indicated that it has two separate location technology applications: SnapTrack, which licenses assisted GPS location technology, and QCT, which manufactures CDMA chipsets. Qualcomm indicated that several major manufacturers are SnapTrack licensees, and stated that there is no air interface at a disadvantage with its core technology. Qualcomm asserted that one manufacturer plans to develop a base-band device incorporating SnapTrack assisted-GPS technology, which will enable manufacturers to produce handsets by 3Q 2001.

Qualcomm plans to provide sample GPS chipsets for base-band and RF (cellular and GPS), along with accompanying reference designs, by September 2000. Qualcomm stated that some of its equipment manufacturer customers should be able to produce handsets within 6 months after that. Qualcomm has completed extensive testing for combined handset solutions. A handset sample is needed to test software in the field and production can begin 6 months after sample is tested. Qualcomm stated that it has overcome interference problems associated with the cellular and GPS frequencies to develop a unified antenna that is used in prototype handsets. Some loss of reception was budgeted into the design for this antenna. Qualcomm asserted that for GPS hardware, battery use is insignificant and extra memory will be integrated into the chipset, but less memory is needed with time-domain processing.

Ericsson commented that integrating the chipsets into a handset would be expensive and will take longer than 6 months. Ericsson stated that the time frame to move from a chipset to a viable handset is more like 9 to 18 months. Ericsson noted that Qualcomm does not supply numerous cell phone components, such as control software, documentation, PC board, user interface, buzzer and keypad, and is not involved in customer support and type acceptance activities. Qualcomm replied that Ericsson has successfully used Qualcomm's chips in the past, and that Qualcomm would provide base band, MSM, IF, and RF chips and software design documentation; moving to a new model is a simple migration from an older model.

Sprint agreed that the additional features, other than GPS, desired by customers would add time to the design and production of new models. Sprint also inquired whether the Qualcomm chipset scheduled for sampling in September will incorporate 1X RTD capability. Qualcomm responded that a chipset incorporating 1X RTD capability, the MX 5100, would be sampled in December 2000.[1]

[1] In subsequent conversation with WTB Policy Division staff, Qualcomm amended this statement to the effect that while samples of a chipset incorporating 1X RTD capability will be available in December 2000, this chipset will not incorporate server-assisted GPS capability. Qualcomm indicated that samples of the MX 5100 chipset, which incorporates both 1X RTD and assisted-GPS capability, will be available in March 2001. *See* letter from Veronica M. Ahern, Nixon Peabody LLP, to Magalie R. Salas, Secretary, FCC dated July 7, 2000, at 2.

Qualcomm stated that, after extensive testing of assisted GPS in favorable and unfavorable environments (urban canyons, high-rises, and rural areas) for AMPS, PDC, GSM, iDEN, and CDMA (AMPS and CDMA results filed with the FCC), it found there are certain environments where assisted GPS will fail (e.g., in a building with a metal roof and metal windows). Results of the assisted-GPS test demonstrated suburban highway accuracy to be 5-30 meters; urban high-rise accuracy was 30-90 meters. With network enhancements, assisted GPS would work better in buildings.

Qualcomm tested the AFLT technology with Sprint and concluded that it would be difficult to meet the accuracy mandates using AFLT. Qualcomm also expressed the opinion that the E-OTD hybrid solution, which is similar to AFLT, would not meet the accuracy mandates.

Ericsson stated that it might be able to provide E-OTD handsets for GSM systems towards the end of 2001, but can not promise.

VoiceStream anticipated that E-OTD handsets would be available to meet the requirement for 50% new activation by October 1, 2001, but is unsure about availability of network infrastructure – possibly by 3Q or 4Q 2001. VoiceStream also indicated that standardized interfaces to PSAPs have not yet been finalized. VoiceStream further expressed the opinion that cell i.d. and timing advance may be slightly less accurate than the 200-500 meters estimated by Ericsson.

2. Will the PSAPs be ready?

APCO indicated that there has been a lack of information in the PSAP community, but that is changing and there is significant interest in making Phase II happen. As for Phase I, there were in excess of 3,000 requests from PSAPs (now about 60%). Three to four hundred PSAP personnel have attended APCO's recent seminar series, suggesting there is interest in Phase II. For example, in Texas, there was almost 0% Phase I implementation one year ago, and today there is almost 100% implementation. There has been substantial progress after the cost recovery rule clarification, but there is need to break the logjam for the handset approach to Phase II since carriers are blaming manufacturers for not producing and manufacturers are blaming carriers for not ordering. PSAPs are more interested in Phase II than Phase I and want, in some cases, to go directly to Phase II, but do not understand that Phase I is a necessary component of Phase II and will provide the fallback when a call cannot be located by Phase II technology. Costs to PSAPs for equipment necessary for Phase II are not that large.

Sprint reported that it has received requests for Phase II and has been proactive because there is a lot more interest than for Phase I. Carriers expressed concern that most costs for Phase II implementation are on carriers' side, not the PSAPs' side. VoiceStream estimated that carrier expenses for implementing Phase II would be 10 to 100 times higher than implementing Phase I.

4. What are other factors affecting the utility and efficiency of these solutions and the decisions that carriers will make?

Verizon stated that it is in the process of introducing tri-mode (PCS/ CDMA 800/ analog) handsets. Handset replacement amongst its existing customer base would be problematic and very costly, and thus requires a network solution today and probably a handset solution tomorrow. There are also concerns with first generation products (CDMA in particular). Improvements in accuracy may have to wait until second and third generation products.

Sprint indicated that there are serious operational deployment issues for handset implementation that will involve considerable negotiations between handset and network people, as well as a substantial testing phase to resolve glitches. In some cases, there will be a more expensive handset for a service that is not available everywhere. Sprint is also concerned about the large carrier investment with possibly little or no return on the investment.

APCO is concerned with customer unawareness about the safety constraints on wireless E911, because many wireless callers assume the PSAP knows where they are located, as is the case with calls from wireline phones.

Sprint stated there will be a financial backlash on carriers if someone can not be located. Also, other new services are being deployed, e.g., 1X capability which provides data rates of 144 kbps and doubling of voice capacity. Sprint does not want to market GPS handsets without 1X capability.

APCO reiterated its concern that the original FCC directive of 1996 has not spurred satisfactory movement on the part of carriers. APCO also expressed concern that every day of delay means more non-compliant phones will be sold. Sprint responded that it is not suggesting further delay, but would like to deploy technology that can provide location accuracy to the several hundred meters level, such as AFLT, simultaneous with the introduction of GPS handsets.

APCO expressed concern that implementing AFLT would impose huge infrastructure costs, and will not provide the requisite accuracy levels. Sprint stated that AFLT and GPS standards are the same, so an AFLT-capable network will support GPS. Sprint further clarified that assisted GPS is its preferred long-term approach, but that it would like to have multiple mechanisms to be comfortable with E911, such as GPS with AFLT fallback.

Qualcomm noted that GPS could be deployed without Location Measuring Units (LMUs) that are needed for E-OTD. A GPS chip will be available by September 2000, and a chipset with 1X and GPS by December 2000.[2] AFLT is hybrid that can be employed with GPS. If a handset can see less than three satellites, add one base station; less than two satellites, add two base stations.

[2] See note 1 above.

5. Are you comfortable it works?

Sprint replied that the assisted GPS technology works well based on the trials they have participated in, but the problem is getting GPS out in the market. Sprint also expressed concern that assisted GPS has never been deployed or tested on a broad commercial scale and therefore, it is difficult to say definitively how well it would work in a real-life deployment.

VoiceStream asserted that with E-OTD it could hit 100-meter accuracy. Qualcomm challenged this assertion, expressing the opinion that under ideal circumstances E-OTD with GSM systems could only reach an accuracy level of 150-200 meters.

Ericsson stated that given availability representations, carriers are reluctant to place orders and manufacturers can not produce until orders are placed. It is the chicken and egg phenomenon.

Qualcomm stated that it thinks that AFLT does not meet the 100-meter accuracy standard. Its testing has yielded poor results, and Qualcomm believes it is unlikely it will meet the standard. Also, Qualcomm stated that E-OTD raises bandwidth concerns for GSM that make it a problematic approach for ever achieving reasonable accuracy levels.

VoiceStream challenged Qualcomm's characterization of GSM technology and stated that it is running a large E-OTD in Texas, and, so far, 40% of the results are within 50 meters. Testing will continue over the next several months. Also, VoiceStream indicated that there are techniques in E-OTD that can improve the accuracy with GSM.

6. Why not go ahead and order handsets from suppliers?

Verizon stated that legacy equipment is a huge problem and has a strong preference for a network solution. Sprint favors assisted GPS for CDMA, but recognizes the competitive pressures that exist for manufacturers and the chicken and egg problem. Sprint has asked manufacturers to develop assisted-GPS technology, but manufacturers will not do so on speculation. Sprint stated that the timing has not been right to place an order.

7. Conclusions

Qualcomm stated that its GPS technology will be available in the near future and meets the mandated accuracy and reliability. Its technology is widely licensed and will be available for all interfaces. Qualcomm is skeptical of hybrid solutions.

VoiceStream stated that it is committed to its E-OTD technology, and there will not be any other technology available for GSM in the allowed time frame. Though there are cost implications and commercial service implications, the first option is to use E-OTD.

Sprint stated that it could not meet performance, cost, and schedule criteria all at once. Instead, Sprint will have to use multiple technologies.

Ericsson expressed concern about commercializing solutions and the ability to provide infrastructure. There is some uncertainty whether the technologies can meet the performance requirements. The best approach is not to pursue multiple options but to direct investment towards fewer options.

APCO stated that delays are bad for public safety. Everyone has to be realistic, but lives are at stake. The technology exists, but it is needed on the street.

Verizon stated that its trying hard to meet the mandate, but more testing needs to be done. If there are a large number of PSAP requests, Verizon could have difficulty meeting the deployment schedule. Verizon indicates that it will do its best but is not sure if a single approach will work for the whole country.

FCC E911 Multi-Party Meeting
June 29,2000

Name:	**Company/Organization:**
Joe Hanna	APCO
Bob Gurss	APCO
Barbara Baffer	Ericsson
Scott Bloebaum	Ericsson
William Gast	Ericsson
Bob Bromery	FCC/OET
Bob Eckert	FCC/OET
Dale Hatfield	FCC/OET
Alexander Dobrev	FCC/WTB
Patrick Forster	FCC/WTB
Dan Grosh	FCC/WTB
Gil Hopenstand	FCC/WTB
Jennifer Kolen	FCC/WTB
Bill Lane	FCC/WTB
Marty Liebman	FCC/WTB
Ron Netro	FCC/WTB
Jim Schlichting	FCC/WTB
Blaise Scinto	FCC/WTB
Tom Stanley	FCC/WTB
Tom Sugrue	FCC/WTB
Jonas Neihardt	QUALCOMM INC.
Sanjay Jha	QUALCOMM INC.
Saed Younis	QUALCOMM INC.
Ellen Kirk	Snap Track
Jonathan Chambers	Sprint PCS
Brian Finnerty	Sprint PCS
Terry Rayburn	Sprint PCS
Bruce Ciotta	Verizon Wireless
Luisa Lancetti	Verizon Wireless (Wilkinson Barker Knauer)
Bob Calaff	Voice Stream
Beth Frasco	Voice Stream
Brian O'Connor	Voice Stream
Robert Rowe	Voice Stream

June 28, 2000

Format/Questions for E911 Phase II Multi-Party Meetings

Ground rules:

- Two to three representatives per company, maximum.
- No presentations. We are interested in obtaining responses to questions. Any presentations may be submitted separately in writing.
- Commission staff will prepare a summary of the meeting for ex parte notification purposes.

Proposed Order for addressing issues, with accompanying questions:

I. Accuracy standards (suggested timeframe: 30 minutes)

1.a. Are there network-based technologies that meet our current accuracy standards for each of the five air interfaces (GSM, CDMA, TDMA, iDEN, and AMPS)?
1.b. What level of accuracy can network-based technologies provide for these air interfaces?
1.c. Is there reliable test data to support this conclusion? Can such data be made available to the Commission (if necessary, on a confidential basis, but preferably on the public record)?
1.d. Has this test data been independently verified by carriers or by other independent parties?
1.e. If not, how should such data be obtained? Can it be obtained in time for carriers to make informed decisions?

2.a. Are there handset-based technologies that meet our current accuracy standards for each of the five air interfaces (GSM, CDMA, TDMA, iDEN and AMPS)?
2.b. What level of accuracy can handset-based technologies provide for these air interfaces?
2.c. Is there reliable test data to support this conclusion? Can such data be made available to the Commission (if necessary, on a confidential basis, but preferably on the public record)?
2.d. Has this test data been independently verified by carriers or by other independent parties?
2.e. If not, how should such data be obtained? Can it be obtained in time for carriers to make informed decisions?
2.f. Have only prototype handsets thus far been tested? Have ALI tests been conducted while a handset is in normal operation? If actual production models will differ in structure (e.g., incorporation of GPS antenna and other hardware into handset) how can we be assured of the accuracy of handset test data, and the ability of the handset to achieve required accuracy and maintain normal operation (given the possible effect of GPS hardware/software on battery drain, memory, interference, etc.)?

3.a. Of the various "hybrid" technologies (e.g., Advanced Forward Lateral Triangulation (AFLT) and Enhanced Observed Time Difference (E-OTD)), what accuracy levels can these technologies currently achieve? What accuracy levels are expected in the future?

3.b. Is there reliable test data to support this conclusion? Can this data be made available to the Commission (if necessary, on a confidential basis, but preferably on the public record)?
3.c. Has this test data been independently verified by carriers or by other independent parties?
3.d. If not, how should such data be obtained? Can it be obtained in time for carriers to make informed decisions?
3.e. Are these technologies applicable only to certain air interfaces?

II. Availability of Solutions (30 minutes)

4.a. Are there network-based solutions available for all of the air interfaces (AMPS, CDMA, TDMA, GSM, iDEN)? Are they at similar stages of development and testing, or have certain air interfaces lagged further behind?
4.b. Are there handset-based solutions available for all of the air interfaces (AMPS, CDMA, TDMA, GSM, iDEN)? Are they at similar stages of development and testing, or have certain air interfaces lagged further behind?
4.c. What is the status of GPS standards for each of the air interfaces? How will the standard-setting schedule affect deployment of handsets for each air interface?
4.d. Are any of the air interfaces technically incompatible with either network or handset-based solutions?
4.e. Are there other aspects of a particular air interface that would make a network-based or handset-based solutions cost-prohibitive?
4.f. If so, what is the magnitude of the cost differential?
4.g. How soon will handset manufacturers be able to bring GPS-capable handsets to market – for each air interface? How soon will handset manufacturers be able to bring E-OTD or AFLT-capable handsets to market – for each air interface?
4.h. One issue with handset-based solutions has been that they do not provide coverage for roamers and older handsets. How do proponents of handset-based technologies intend to address this issue?

III. Timing/Implementation Deadlines (20 minutes)

5.a. Will carriers be able to meet the specified implementation deadlines?
5.b. What are the major impediments or risks associated with meeting the deadlines? Regulatory? Technical? Economic? Other?
5.c. What progress is being made by PSAPs? When will they be ready to receive and utilize Phase II information?
5.d. Is there a possibility that there may be a widespread lack of readiness to implement Phase II on the PSAP side, similar to the experience with Phase I?
5.e. Are there actions the FCC could take to facilitate PSAP implementation of Phase II?

IV. Carrier Commitments/Incentives (20 minutes)

6.a. What assurances do carriers need in order to make place firm orders with handset or network infrastructure manufacturers?
6.b. How specifically can we enhance the incentive for carriers, manufacturers, and other stakeholders, to move quickly to get E911 Phase II capability deployed?
6.c. Alternatively, what penalties for non-compliance should the FCC consider, if some carriers fail to meet the implementation deadlines?
6.e. Some parties have proposed that carriers be deemed in compliance with our handset deployment requirements if they place firm orders for sufficient quantities of compliant handsets, early enough. This proposal seems to lack enforceability and could potentially result in multi-year delays in implementation. Are there other ways to break the apparent chicken-egg impasse between carriers and handset manufacturers?

V. Wrap Up (15 minutes)
Each participant will be given three minutes to respond to points or arguments raised that they may not have gotten a chance to fully address.